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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/800,195	03/12/2004	Junyan Dai	5347.218	8744

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EXAMINER

LEE, SIN J

ART UNIT PAPER NUMBER

1752

DATE MAILED: 04/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/800,195	Applicant(s) DAI ET AL.	
	Examiner Sin J. Lee	Art Unit 1752	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 12 March 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-64 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 37-40 and 44-48 is/are allowed.
- 6) ☒ Claim(s) 1-7, 10, 14-16, 23, 36, 41-43, 49, 50 and 57-64 is/are rejected.
- 7) ☒ Claim(s) 8, 9, 11-13, 17-22, 24-35 and 51-56 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>8-19-04</u> . | 6) <input type="checkbox"/> Other: _____  |

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## DETAILED ACTION

### ***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-7, 10, 41-43, 57, and 58 are rejected under 35 U.S.C. 102(b) as being anticipated by Ober et al (5,290,397).

In Example 4, Ober teaches E-beam exposure and development of pentamethyldisiloxane modified polystyrene-polyisoprene block copolymer, which contains a silicon weight percent of *at least about 5 percent*. Therefore, the prior art teaches present inventions of claims 1-7, and 14 (assuming that Ober's copolymer contains 5 wt.% of silicon, this value lies within the present ranges of claims 3 and 4, and thus, it is the Examiner's position that Ober's copolymer would inherently have an oxygen reactive ion etch rate of not more than about 0.35 nm/s as presently recited in claim 2).

With respect to present claims 10 and 41, Ober teaches (col.6, lines 1-13) that the silicon component is incorporated into the block copolymer using a hydrosilylation reaction. Therefore, the prior art teaches present invention of claims 10 and 41-43.

With respect to present claims 57 and 58, Ober teaches a process for forming a resist pattern which includes a step of reactive ion etching (see claims 1 and 6). Also, in col.2, lines 2-4, Ober states that the etch rate of the polymer decreases as the wt.% of

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silicon increases. Therefore, the prior art teaches present inventions of claims 57 and 58.

3. Claims 23, 36, 49, and 50 are rejected under 35 U.S.C. 102(b) as being anticipated by Felter et al (5,989,776).

Felter teaches a method of producing a patterned array of features in the size range of 0.4-0.05 um using projection lithography and extreme ultraviolet radiation, and Felter performs the lithography by using a photoresist composition containing boron carbide polymers (see abstract and claim 1). Felter's photoresist material contains little or no oxygen because oxygen is strongly attenuating for short wavelength radiation (see col.5, lines 8-14). Therefore, Felter teaches present inventions of claims 23 and 36.

Since Felter teaches a photoresist material made of boron carbide polymer, it is the Examiner's position that using Felter's photoresist material would inherently increase the oxygen reactive ion etch resistance as presently recited. Therefore, Felter teaches present inventions of claims 49 and 50.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ober et al (5,290,397).

Ober is discussed above in Paragraph 2. Ober teaches (col.5, lines 18-20) that his block copolymer has molecular weight range of 500 to 10,000,000. Since this range overlaps with present ranges of claims 14-16, the prior art's range would have made present range *prima facie* obvious. In the case "where the [claimed] ranges overlap or lie inside ranges disclosed by the prior art," a prima facie case of obviousness would exist which may be overcome by a showing of unexpected results, In re Wertheim, 541 F.2d 257, 191 USPQ (CCPA 1976). Therefore, Ober's teaching renders obvious present inventions of claims 14-16.

6. Claims 57-64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Felter et al (5,989,776) in view of Lin (5,304,453).

As explained above in Paragraph 3, Felter teaches a method of producing a patterned array of features in the size range of 0.4-0.05 um using projection lithography and extreme ultraviolet radiation, and Felter performs the lithography by using a photoresist composition containing boron carbide polymers. Felter coats his photoresist material onto a silicon substrate, and the photoresist is then exposed to extreme UV radiation. After the development, the remaining photoresist is used as an etch barrier in the following oxygen plasma etching step. (see col.5, lines 8-46, col.6, lines 16-17). It is well known in the art that the oxygen plasma etching and oxygen reactive ion etching are interchangeable plasma etching techniques, as evidenced by Lin, col.2, lines 48-50. Therefore, it would have been obvious to one of ordinary skill in the art to use oxygen reactive ion etching technique in Felter's invention because oxygen plasma etching and oxygen reactive ion etching were art-recognized equivalents at the time the invention

was made. Therefore, Felter in view of Lin would render obvious present inventions of claims 57-59 and 61-64 (it is the Examiner's position that using Felter's photoresist material containing boron carbide polymer would inherently decrease the reactive ion etch rate of the polymer as presently recited).

With respect to present claim 60, Felter teaches that his photoresist material can contain organo silicon polymer in order to improve the performance of the photoresist (see col.5, lines 21-26). Therefore, Felter in view of Lin would render obvious present invention of claim 60.

***Allowable Subject Matter***

7. Claims 8, 9, 11-13, 17-22, 24-35, and 51-56 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Ober does not teach or suggest present silylstyrene polymer of claim 8 nor present vinylsilane polymer of claim 9. Ober does not teach or suggest present hydrosilylation agent of claim 11. Ober does not teach or suggest present polymer of claims 12, 13, and 17-20. Ober does not teach or suggest present limitation of claim 22. Felter (either alone or in combination with Lin) does not teach or suggest present wt.% of boron of claim 24 nor the present boron concentration of claim 25. Felter (either alone or in combination with Lin) does not teach or suggest present polymers of claims 26-32, 34, and 35. Felter (either alone or in combination with Lin) does not teach or suggest present reaction method of claim 44, 51, and 53. Felter (either alone or in combination with Lin) does not

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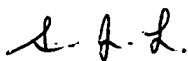
teach or suggest present polymer of claim 55 nor the present boron concentration of claim 56.

8. Claims 37-40 and 44-48 are allowed. Ober does not teach or suggest present method of claim 37 for forming a silicon-containing resist copolymer. Felter does not teach or suggest present method of claim 44 for forming a boron-containing resist polymer.

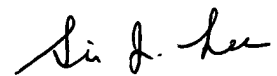
9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sin J. Lee whose telephone number is 571-272-1333. The examiner can normally be reached on Monday-Friday from 9:00 am EST to 5:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly, can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



S. Lee  
April 3, 2005



Sin J. Lee  
Patent Examiner  
Technology Center 1700